

REMARKS

Claims 16 and 19-23 are pending in this application. By this Amendment, claim 16 is amended. Support for the amendment to claim 16 can be found, for example, in Examples 1 and 2 of the instant specification. P62/L1-15; P65/L1-14. No new matter is added. In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

Rejections Under 35 U.S.C. §102 and/or §103**A. Uchida**

The Office Action rejects claims 16, 19-21 and 23 under 35 U.S.C. §102(b), or in the alternative under 35 U.S.C. §103(a), over JP 7-048111 ("Uchida").

Claim 16 recites "[a] method for producing a nanowire, comprising the step of: carrying out at least a modification treatment on a multi-walled carbon nanotube having at least two layers of graphene sheets so as to produce a nanowire having a core portion and a functional layer, the core portion having a carbon nanotube having at least one layer of the graphene sheets, the functional layer formed around the core portion and having a modified graphene sheet originated from at least one of the graphene sheets around the core portion, wherein the modification treatment is a combination of (1) a mechanochemical treatment and (2) a heating treatment in an acidic solvent, performed sequentially in that order" (emphasis added). Uchida does not teach or suggest such a method.

The Office Action asserts that Uchida discloses a process for treatment of multi-walled nanotubes including subjecting the nanotubes to mechanochemical treatment, such as either wet or dry pulverization, followed by baking the resulting product. The Office Action further asserts that Uchida discloses treating pulverized nanotubes with an acid such as nitric acid. Notwithstanding these assertions, Uchida does not teach or suggest the method of claim 16.

Claim 16 recites a modification treatment that is a combination of a mechanochemical treatment and a heating treatment in an acidic solvent, performed sequentially. Uchida specifically discloses that "elevated-temperature baking of the dried distributed object is carried out" (emphasis added). [0010]. Thus, heat treatment does not take place in an acidic solvent, as in the method of claim 16. The Office Action refers to Example 1 of Uchida as evidence that pulverized nanotubes are treated with acid. However, even in Example 1, the pulverized product is treated with nitric acid in a filter, before baking takes place. [0011]. While Uchida may disclose heat treatment and treatment with an acid, it does not teach or suggest heat treatment in an acidic solvent, as in claim 16. Accordingly, Uchida does not teach or suggest the method of claim 16.

Claim 16 is not anticipated by and would not have been rendered obvious by Uchida. Claims 19-21 and 23 depend from claim 16, and thus also are not anticipated by and would not have been rendered obvious by Uchida. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Ago

The Office Action rejects claims 16, 19-21 and 23 under 35 U.S.C. §102(b), or in the alternative under 35 U.S.C. §103(a), over "Work Function and Surface Functional Groups of Multiwall Carbon Nanotubes" to Ago et al. ("Ago").

Claim 16 recites "[a] method for producing a nanowire ... wherein the modification treatment is a combination of (1) a mechanochemical treatment and (2) a heating treatment in an acidic solvent, performed sequentially in that order" (emphasis added). Ago does not teach or suggest such a method.

The Office Action asserts that Ago discloses a process for the treatment of multi-walled carbon nanotubes wherein the nanotubes are subjected first to repeated to sonication,

centrifugation and filtration and then are subjected to oxygen plasma treatment.

Notwithstanding this assertion, Ago does not teach or suggest the method of claim 16.

Ago discloses four different types of multiwall nanotubes: (i) purified multiwall nanotubes, (ii) air-oxidized multiwall nanotubes, (iii) plasma-oxidized multiwall nanotubes and (iv) acid-oxidized multiwall nanotubes. See Ago at 8117. The Office Action in describing the teachings of Ago presumably refers to type (iii), which are subjected to purification and then oxygen plasma treatment. The type (iii) multiwall nanotubes of Ago, though subjected to oxygen plasma treatment, are not subjected to a heating treatment in an acidic solvent. Only the type (iv) multiwall nanotubes of Ago are subjected to treatment in acid. However, such treatment is not preceded by mechanochemical treatment (raw multiwall nanotubes are used), as recited in claim 16. Accordingly, Ago does not teach or suggest a method for producing a nanowire in which modification treatment is a combination of (1) a mechanochemical treatment and (2) a heating treatment in an acidic solvent, performed sequentially in that order.

Claim 16 is not anticipated by and would not have been rendered obvious by Ago. Claims 19-21 and 23 depend from claim 16, and thus also are not anticipated by and would not have been rendered obvious by Ago. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

C. Zhou

The Office Action rejects claims 16, 19-21 and 23 under 35 U.S.C. §102(e), or in the alternative under 35 U.S.C. §103(a), over U.S. Patent Application Pub. No. 2002/0193040 to Zhou ("Zhou").

Claim 16 recites "[a] method for producing a nanowire ... wherein the modification treatment is a combination of (1) a mechanochemical treatment and (2) a heating treatment in

an acidic solvent, performed sequentially in that order" (emphasis added). Zhou does not teach or suggest such a method.

The Office Action asserts that Zhou teaches a process for the treatment of multiwalled nanotubes comprising dispersion of the nanotubes in a suitable liquid medium by an ultrasonic horn, followed by oxidation with a strong acid. The Office Action further asserts that Zhou teaches a process for treatment of multi-walled nanotubes comprising cutting the nanotubes by milling and then treating the cut nanotubes at high temperature in the presence of intercalates. In addition, the Office Action asserts that Zhou teaches a process for treatment of multiwalled nanotubes comprising ion bombardment of the nanotubes, followed by sonication in acid. Notwithstanding these assertions, Zhou does not teach or suggest the method of claim 16.

Zhou discloses a method of processing nanotube materials including introducing intercalating compounds to the nanotubes. See Abstract. In the disclosed methods, nanotubes are subjected to mechanical treatment, such as sonication or milling. [0047]. However, in none of the methods are the processed nanotubes subjected to a heating treatment in an acidic solvent. In Zhou, heat treatment is employed to obtain vapor transport ([0050]), and to dissolve a non-acidic solvent ([0052]), but in no instance are mechanochemically processed nanotubes subjected to heat treatment in an acidic solvent. Thus, Zhou does not teach or suggest the method of claim 16.

Claim 16 is not anticipated by and would not have been rendered obvious by Zhou. Claims 19-21 and 23 depend from claim 16, and thus also are not anticipated by and would not have been rendered obvious by Zhou. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

D. Ago and Niu

The Office Action rejects claim 22 under 35 U.S.C. §103(a) over Ago in view of U.S. Patent Application Pub. No. 2003/0039604 to Niu et al. ("Niu").

Claim 16 recites "[a] method for producing a nanowire ... wherein the modification treatment is a combination of (1) a mechanochemical treatment and (2) a heating treatment in an acidic solvent, performed sequentially in that order" (emphasis added). For the reasons set forth above, Ago does not teach or suggest the method of claim 16. Niu does not cure the deficiencies of Ago.

The Office Action relies on Niu for its teaching of carbon nanotubes that become self-adhering after oxidation, and the formation of hard, dense mats by dispersing, filtering and drying of oxidized nanotubes. However, Niu, like Ago, does not disclose a method for producing a nanowire wherein a modification treatment is a combination of (1) a mechanochemical treatment and (2) a heating treatment in an acidic solvent, performed sequentially in that order. The methods of Niu involve exposure of nanotubes to peroxygen compound containing compositions. In no instance are nanotubes subjected to mechanochemical treatment followed by a heating treatment in an acidic solvent. As Niu and Ago, either alone or in combination, fail to teach or suggest a method comprising mechanochemical treatment and a heating treatment in an acidic solvent, performed in sequence, Niu and Ago do not teach or suggest the method of claim 16.

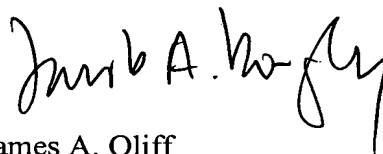
Claim 16 would not have been rendered obvious by Ago and Niu. Claim 22 depends from claim 16, and thus also would not have been rendered obvious by the cited references. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 16 and 19-23 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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